



## **Restoring Landform Geodiversity in Modified Rivers and Catchments**

Ben Smith and Nicholas Clifford

Department of Geography, King's College London, United Kingdom

Extensive human modification and exploitation has created degraded and simplified systems lacking many of the landforms which would characterise healthy, geodiverse rivers. As awareness of geodiversity grows we must look to ways not only to conserve geodiversity but to also restore or create landforms which contribute to geodiverse environments. River restoration, with lessons learned over the last 30 years and across multiple continents, has much to offer as an exemplar of how to understand, restore or create geodiversity.

Although not mentioned explicitly, there is an implicit emphasis in the Water Framework Directive on the importance of landforms and geodiversity, with landform units and assemblages at the reach scale assumed to provide the physical template for a healthy aquatic ecosystem. The focus on hydromorphology has increased the importance of geomorphology within river restoration programmes. The dominant paradigm is to restore landforms in order to increase habitat heterogeneity and improve biodiversity within rivers. However, the process of landform restoration is also a goal in its own right in the context of geodiversity, and extensive compilations of restoration experiences allow an inventory and pattern of landform (re-) creation to be assembled, and an assessment of landform function as well as landform presence/absence to be made.

Accordingly, this paper outlines three principal research questions:

Which landforms are commonly reinstated in river restoration activities?

How do these landforms function compared to natural equivalents and thus contribute to 'functional' geodiversity as compared to the 'aesthetic' geodiversity?

How does landform diversity scale from reach to catchment and contribute to larger-scale geodiversity?

Data from the UK National River Restoration Inventory and the RHS are combined to assess the frequency and spatial distribution of commonly created landforms in relation to catchment type and more local context. Analysis is also undertaken to show landform position within catchments and the wider river network. We conclude that river restoration could play an important role in the assessment and improvement of geodiversity within heavily-modified European catchments